NUTRI-CHECK NET
OPTIMISING CROP NUTRITION

Deliverable 4.2
NUTRI-CHECK NET platform initial version

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Reviewer(s):	Sarah Kendall (ADAS)
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Version History

Version number	Implemented by	Date	T
Version 1	A. Fournarakos P. Stamatelopoulos	14/06/2024	
First Review	Sarah Kendall	20/06/2024	
Final Version	A. Fournarakos P. Stamatelopoulos	25/06/2024	

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Public Summary

Deliverable 4.2 – NUTRI-CHECK NET Platform Initial Version pertains to the launch of the initial version of the NUTRI-CHECK NET Platform (https://platform.nutri-checknet.eu/), as described in Task 4.2 “NUTRI-CHECK NET Platform development”. This document acts as a complementary report, outlining the progress revolving around the design, development and deployment of the platform, highlighting the structure of the platform and the technologies used.

Executive Summary

Work Package 4 is responsible for developing and launching the NUTRI-CHECK NET (NCN) Platform, a digital platform whose primary goal is to facilitate access to the project’s nutritional decision tools and protocols inventory, built upon research projects, available tools and services and recommendation systems applied in Europe. This inventory, created by Work Package 2, acts as the cornerstone of the platform’s design and functionality, supported by additional features, aiming to enhance the user experience and flow of information towards end users.

The NCN Platform was launched in M14 of the project (Milestone Version), designed and developed as a proof-of-concept showcase of the project’s inventory, aiming to give form and highlight the data produced from all relevant tasks of WP2. The initial version, deployed at the end of Month 18, offers a comparison feature and a restructured data model for the Available tools and services, alongside general data refinements and fixes to the platform’s entries.

This document acts as a complementary report to the release of platform’s initial version, providing the context and background of the platform, a thorough presentation of the platform’s design and functionalities, the technologies used during the development, as well as the next steps to be undertaken regarding the platform’s further development.

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1. Introduction

This document acts as a complementary report for the release of the initial version of the NUTRI-CHECK NET platform. The present report documents the progress achieved in T4.2 of the project "NUTRI-CHECK NET Platform Development", focusing on the development and deployment of the Milestone (M14) and the initial (M18) version of the NCN Platform (https://platform.nutri-checknet.eu/). The milestone version of the NUTRI-CHECK NET Platform, launched in Month 14 of the project, was designed and developed as a proof-of-concept showcase of the project's inventory, aiming to give form and highlight the data produced from all relevant tasks of WP2. Following the release of this version, the developed platform was continually validated according to feedback from the project's consortium, aiming to ameliorate the user experience and update and amend the data in the platform's inventory. The initial version, deployed at the end of Month 18, offers a brand-new comparison feature, allowing users to compare entries of the same type side-by-side. Moreover, a restructured data model for the Available tools and services was made available, alongside general data refinements and fixes made to the platform.

The platform's primary goal is to facilitate access to the project's nutritional decision tools and protocols, built upon research projects, available tools and services and recommendation systems applied in Europe. Table 1 illustrates the three main elements of the NUTRI-CHECK NET Platform:

Table 1: Description of the NUTRI-CHECK NET Inventory elements

Recommendation Systems	Collection of national nutrient management recommendation systems used in practice by farmers and advisors for nutrient decision-making processes in Europe.
Available Tools and Services	Collection of services and tools utilized by farmers in nutrient management and decision making, including crop sensors, soil sensors, online and desktop applications.
Research Projects	Collection of research projects and literature related to crop nutrition from both EU (HE and H2020) and National projects.

A detailed presentation of the NUTRI-CHECK NET Platform features is presented in Section 2 of the document.

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Terminology

Below, the abbreviations and definitions of all terms used throughout the document are presented:

Table 2: Abbreviations and Definitions.

Abbreviation	Definition
CNC	Crop Nutrition Club
CRUD	Create, Read, Update, Delete
CSS	Cascading Style Sheets
ERD	Entity Relationship Diagram
MVC	Model – View - Controller
NCN	NUTRI-CHECK NET
NEG	National Expert Group
UI	User Interface

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2. Overview of the NUTRI-CHECK NET Platform

The NUTRI-CHECK NET Platform serves as a comprehensive inventory, aiming to share crop nutrition tools widely with stakeholders across Europe. The inventory is comprised of three types of information: i) Recommendation Systems, ii) Tools and Services, iii) Research Projects. The functionalities and features of the platform that are described in this chapter were designed and developed in accordance with the Functional Requirements found in Deliverable 4.1 (the full list of functional requirements may also be found in Annex 1). Each feature presented is also accompanied by the corresponding functional requirements that were fulfilled.

2.1 Design and Validation

Following the original design and validation with the consortium of the wireframe/mock-ups (detailed in D4.1, shown in full in Appendix 1 of the same deliverable), the mock-ups were redesigned in full according to the feedback provided.

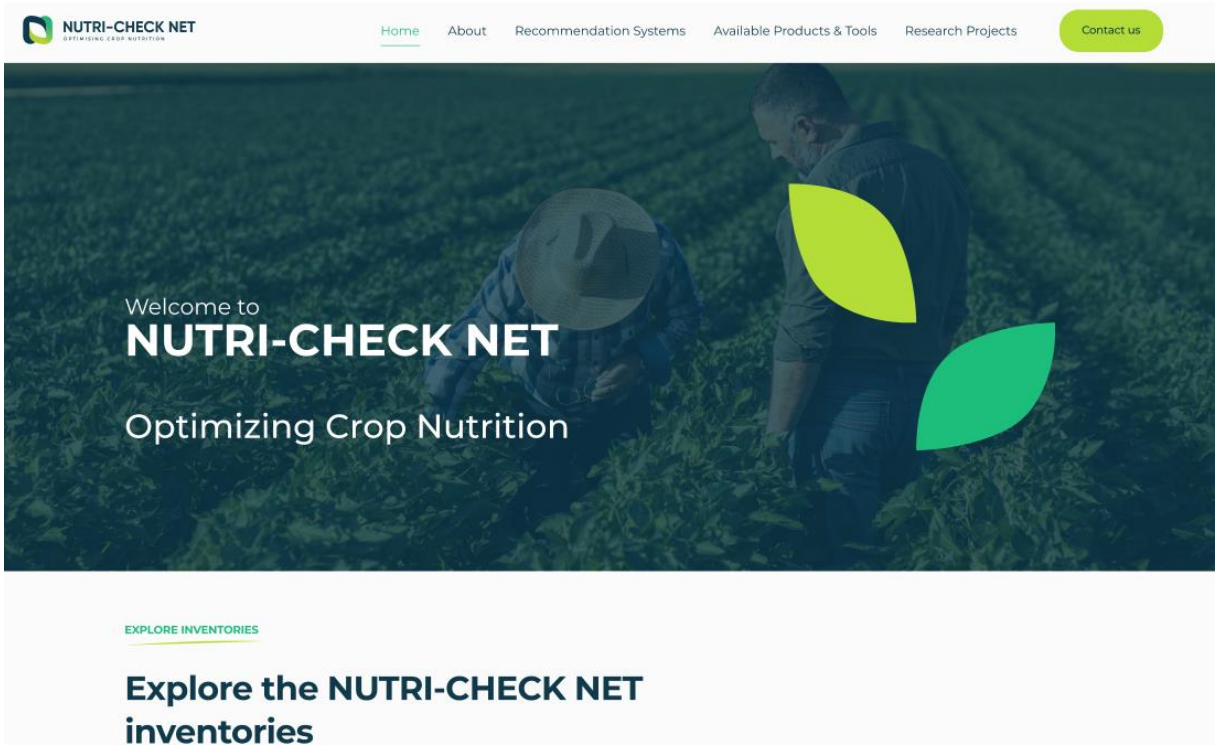

Figure 1: Homepage of the platform mock-ups.

These mock-ups were presented during the project's second consortium meeting in Athens, Greece, where the consortium once more provided their input to refine and optimize the design. These interactive mock-ups served as the guide upon which the platform's design was established for the launch of the Milestone Version. The platform's visual design adheres to all standards related to the accessibility, user experience and branding of the project, and will continue to be refined through user evaluations according to feedback received from end-users during the demonstration events and workshops, where the platform will be showcased.

The NUTRICHECK-NET platform consists of several pages/screens and multiple components to provide all the features described in this section.

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The NUTRICHECK-NET platform follows the layout structure that divides the content into three distinct sections: **header**, **body**, and **footer**. This layout provides a clear and consistent framework for presenting information and elements on a web page.

The platform's elements are all accessible through the header menu, shown in Figure 1 below:

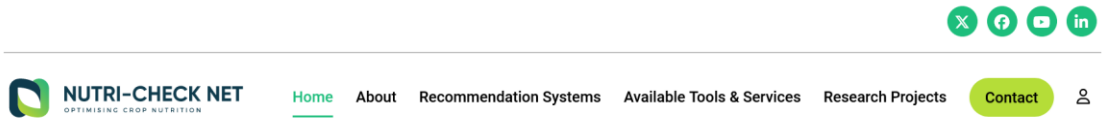

Figure 2: Header of the Platform.

The header remains at the top of every page and contains the project logo and the main navigation menu, allowing users to easily navigate within different sections and pages of the platform.
The navigation menu is persistent as the user scrolls within the boundaries of a page and responsive to support the variety of screen sizes with the use of a "menu-burger" icon.

The body section contains the main content area where each page presents information to the end-users. Sub-sections and components are made available in the body section of each page. The platform's homepage provides access to the inventories of Recommendation Systems, Research Projects and Available Tools and Services. Users may also browse the most recent entries uploaded in each respective inventory.

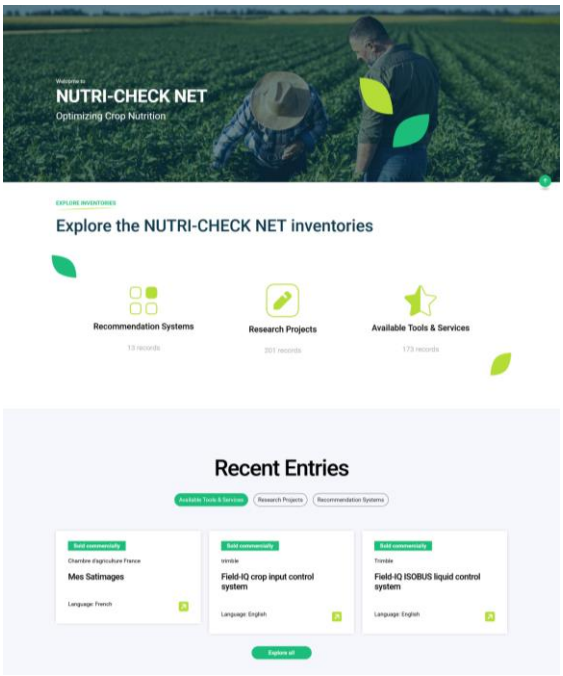

Figure 3: Body section of the Platform.

From the homepage, users may access the "About" section, providing information on the project's aims and ambitions, as well as contextual information on the platform. Users may also sign up for the project's newsletter, in order to stay up to date with the project's activities.

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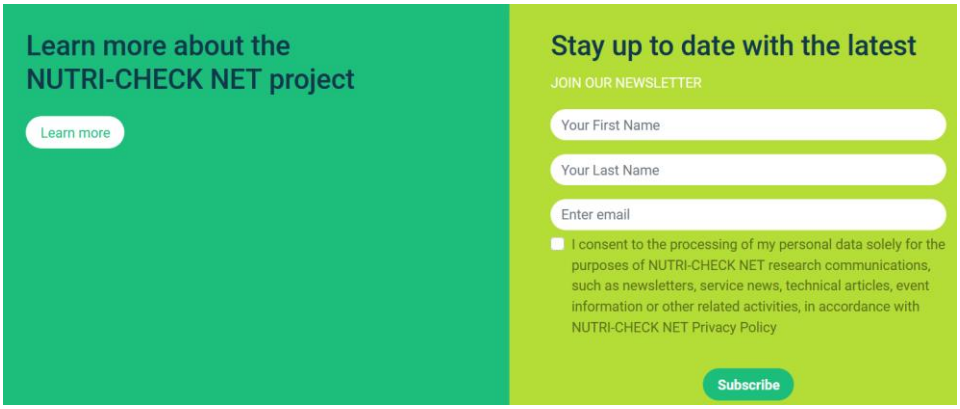

Figure 4: Newsletter subscription form.

The footer contains valuable information pertaining to the project, including the partner organizations, social media and funding information. Moreover, users may access the privacy and cookie policy in order to consent or update their preferences, as well as access the platform disclaimer. The footer section is available on all platform pages.

Figure 5: Footer Section of the Platform.

2.2 Recommendation Systems

*"**Recommendation systems** are methods or guidelines used within countries or regions in Europe to advise on the methods assessing soil nutrient supply and/or crop nutrient requirement of applied nutrients. This will often result in a fertiliser recommendation, which may include advice on rates and/or timings of fertiliser application. This platform includes information on recommendation systems for nitrogen, phosphorus or potassium in wheat, maize or potato crops."*

The first element of the NUTRI-CHECK NET inventory contains the Recommendation Systems, currently comprised of 13 recommendation systems, as provided by Task 2.2 of the project.

2.2.1 Recommendation System List View

Upon accessing the Recommendation Systems element from the platform's navigation menu, users are presented with a list view of all the available recommendation systems (Figure 6). The page is split into columns, where users may search the Recommendation Systems inventory by using the dedicated search bar or filter through the entries by ticking the desired filters. These filters represent the following categories: Countries, crop and nutrient types covered by the Recommendation Systems and languages in which the system is available in. In the main area of the page, the list of results in the form of cards is presented.

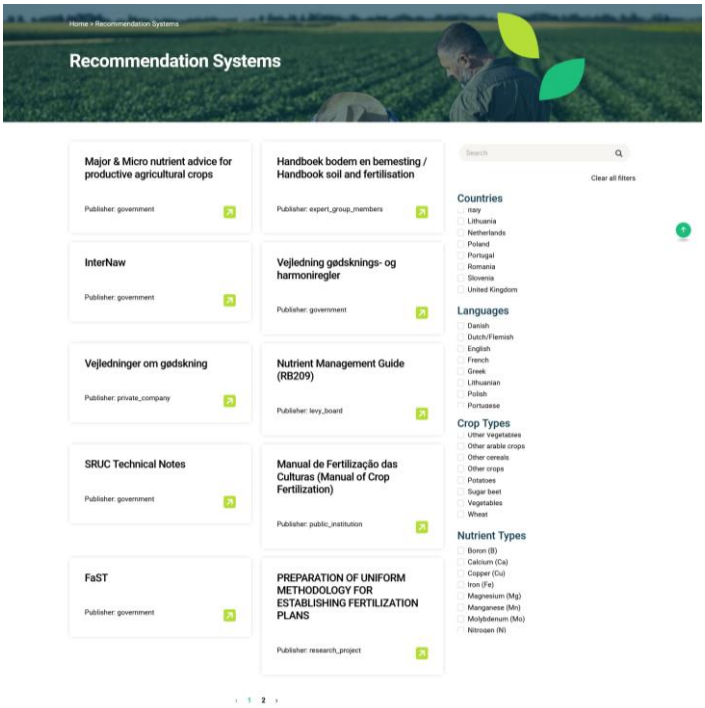

Figure 6: List view of the Recommendation Systems.

For access via smaller screen sizes (i.e. smartphones) the sidebar is collapsed/hidden, and a button is presented for the user to open.

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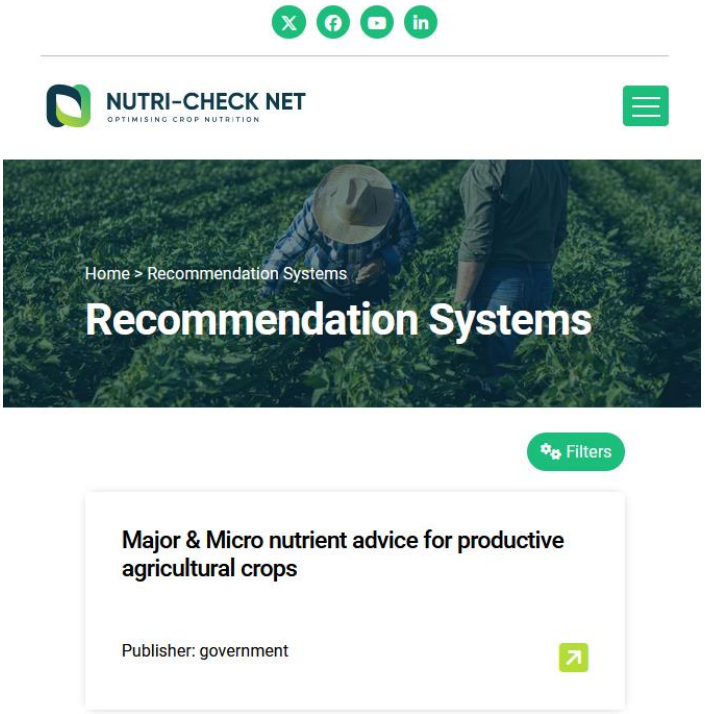

Figure 7: Mobile view of the Recommendation System page.

Upon clicking on an entry, users are taken into the recommendation system's detailed view.

2.2.2 Recommendation System Detailed View

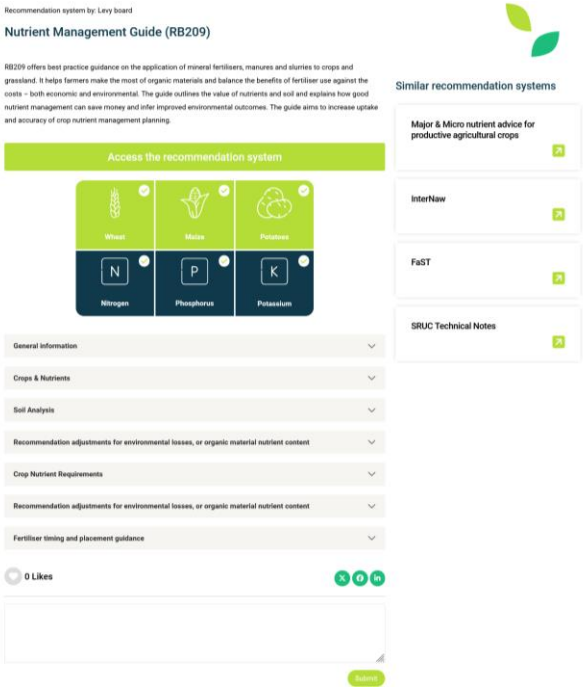

Figure 8: Recommendation System detailed view.

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At a glance, users are provided with a short description of the recommendation system, as well as a link to access its official documentation. Moreover, a graphic indicating which crop types (Wheat, Maize, Potato) and nutrient types (Nitrogen, Phosphorus, Potassium) are covered by the Recommendation System is displayed.

The data pertaining to the recommendation system is organized in collapsible lists (accordion menus), allowing users to freely control what information is displayed at any given moment. The information in the accordion menus is categorized as follows:

- General Information
- Crops & Nutrients
- Soil Analysis
- Recommendation Adjustments for Environmental Losses, or Organic Material Nutrient Content
- Crop Nutrient Requirements
- Fertilizer Timing and Placement Guidance

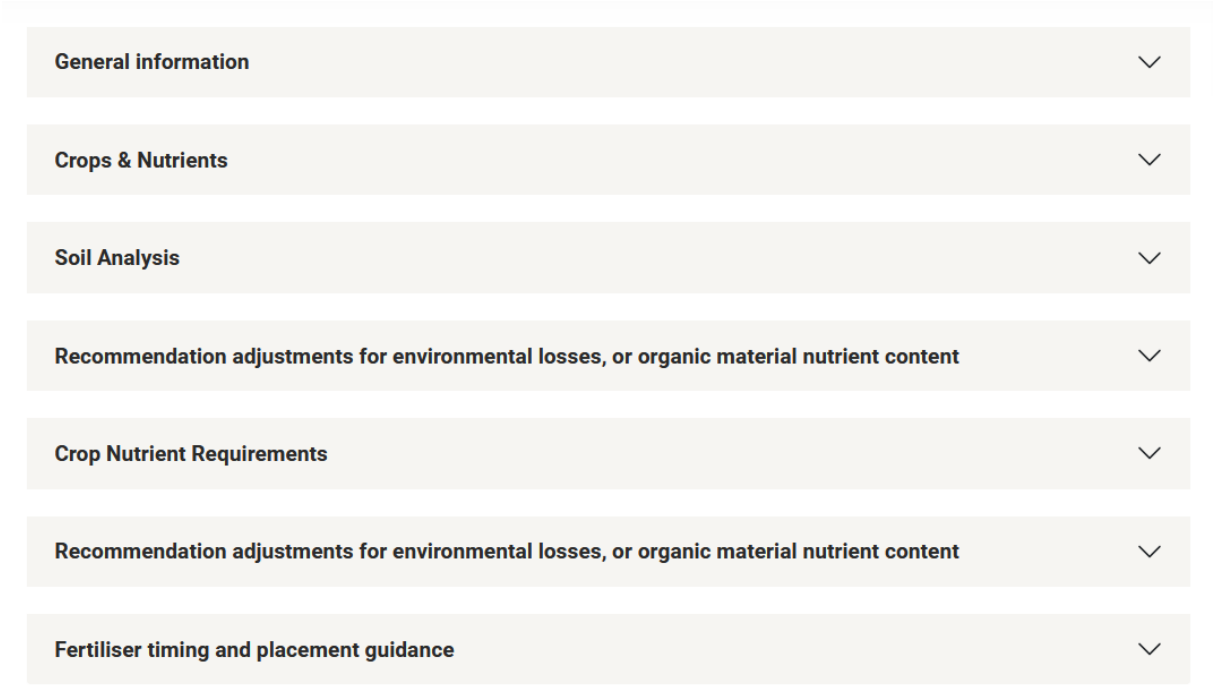

Figure 9: Collapsible list categories of a recommendation system.

Upon clicking on an accordion menu, the information contained inside is displayed. Each individual accordion holds information related to its specific category. Multiple accordion menus may be open simultaneously.

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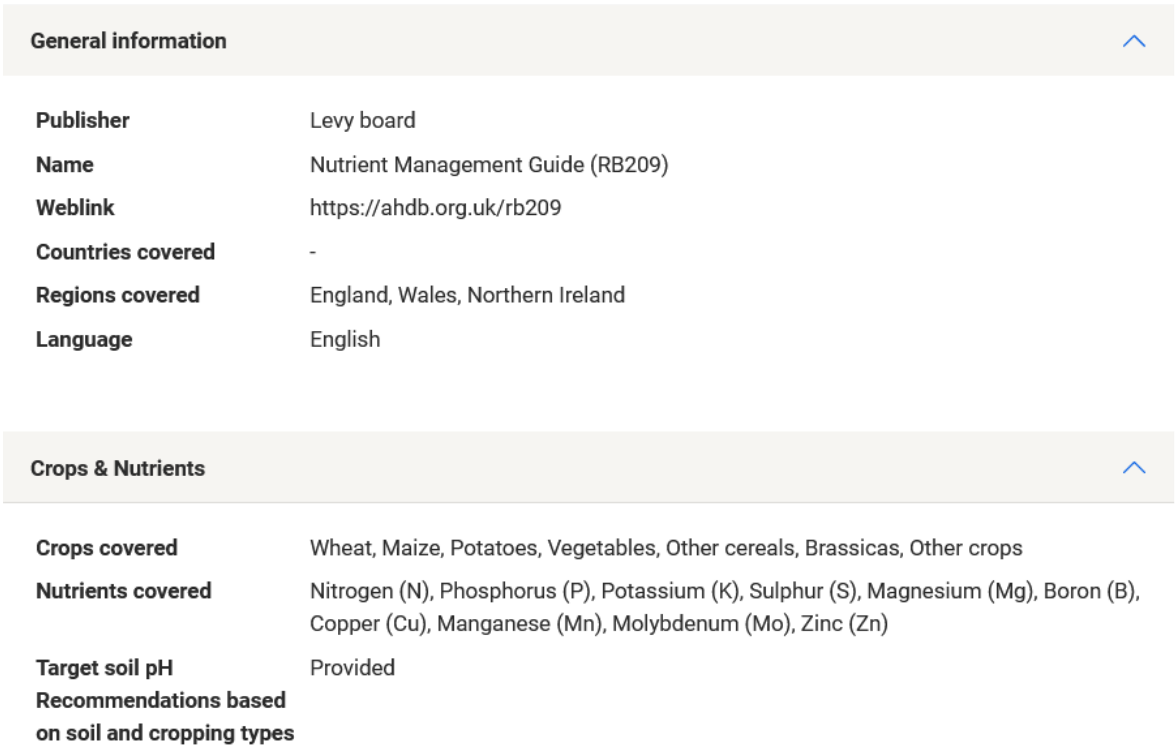

Figure 10: Information contained in the collapsible lists.

Finally, users may like and comment on an entry, or share it on their personal media, however, the "Like" function is available only to registered users.

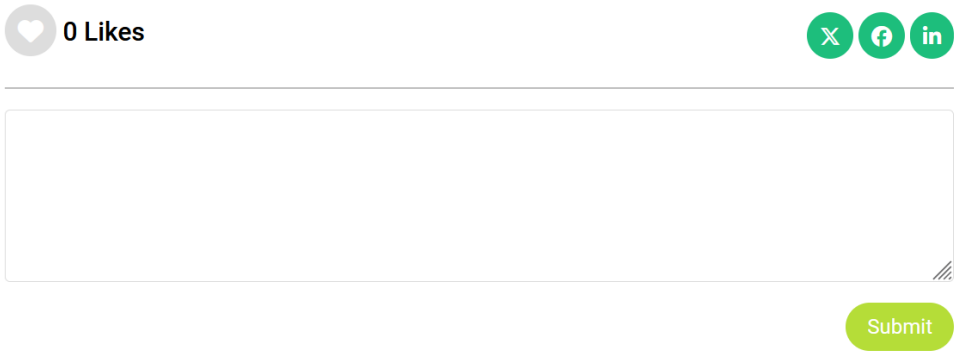

Figure 11: Like and Comment function.

Table 3: Recommendation System functional Requirements fulfilled by the aforementioned functionalities.

Fulfilled Functional Requirements: **FR05**: Share to social media platforms **FR06**: Access List of Nutrient Management Recommendation Systems and Services **FR07**: View Details of Nutrient Management Recommendation Systems and Services **FR08**: Search and Filter Nutrient Management Recommendation Systems and Services **FR15**: View and Post Comments on datasets

2.3 Available Tools and Services

*"Commercial and non-commercial **services and tools** that are used by farmers and advisors in their nutrient management decision making processes. These include, but are not restricted to soil, leaf and tissue analyses, satellite imagery, drone imagery, phone apps, tractor mounted sensors, leaf colour assessments and Brix analysis."*

The Available Tools and services portion of the inventory is currently comprised of 173 records, as collected in Task 2.4 of the project.

2.3.1 Tools and Services List View

Upon navigating to this element, users are provided with a list of all Available Tools and Services.

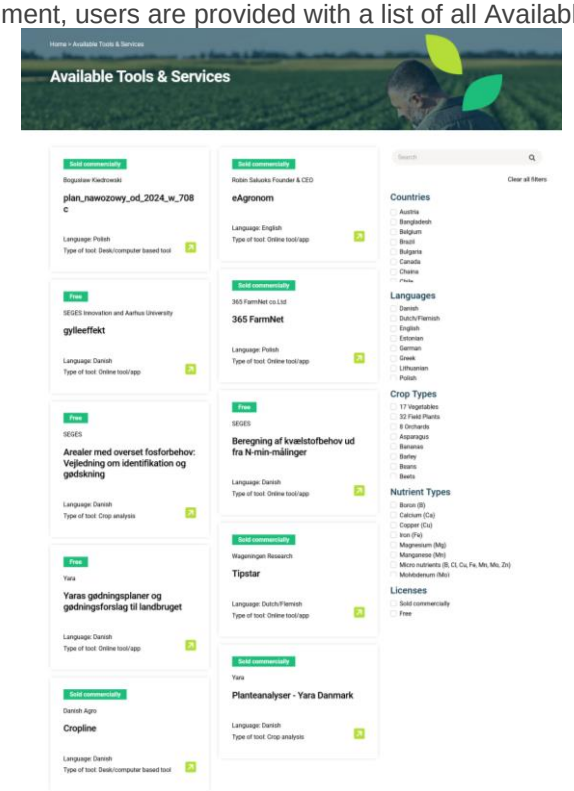

Figure 12: Tools and Services list view.

Clicking on an entry directs you to its detailed view, as seen in Figure 13 below.

2.3.1 Tools and Services Detailed View

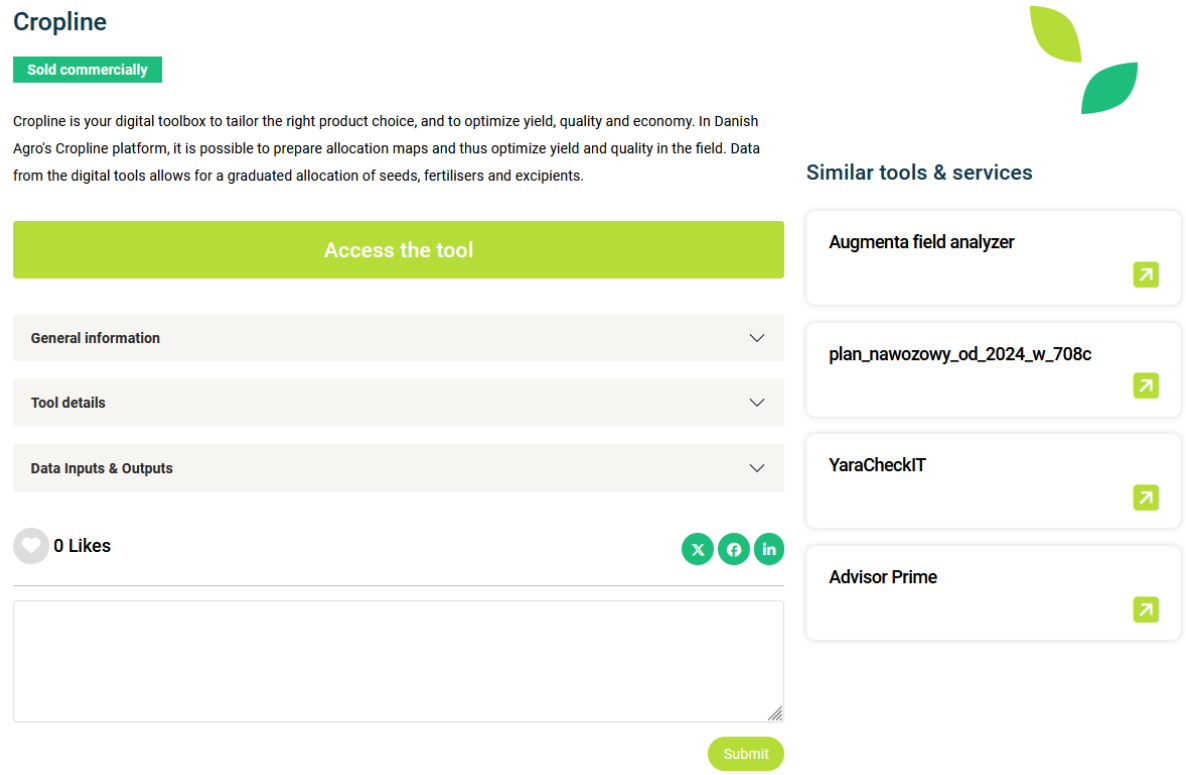

Figure 13: Tools and Services detailed view.

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The data pertaining to the tools and services is organized in accordion menus, allowing users to freely control what information is displayed at any given moment. The information in the accordion menus is categorized as follows:

- General Information, containing a brief overview of valuable information for the tool
- Tool Details, highlighting the type of tool and what it assesses
- Data Inputs and Outputs required for the tool's assessment

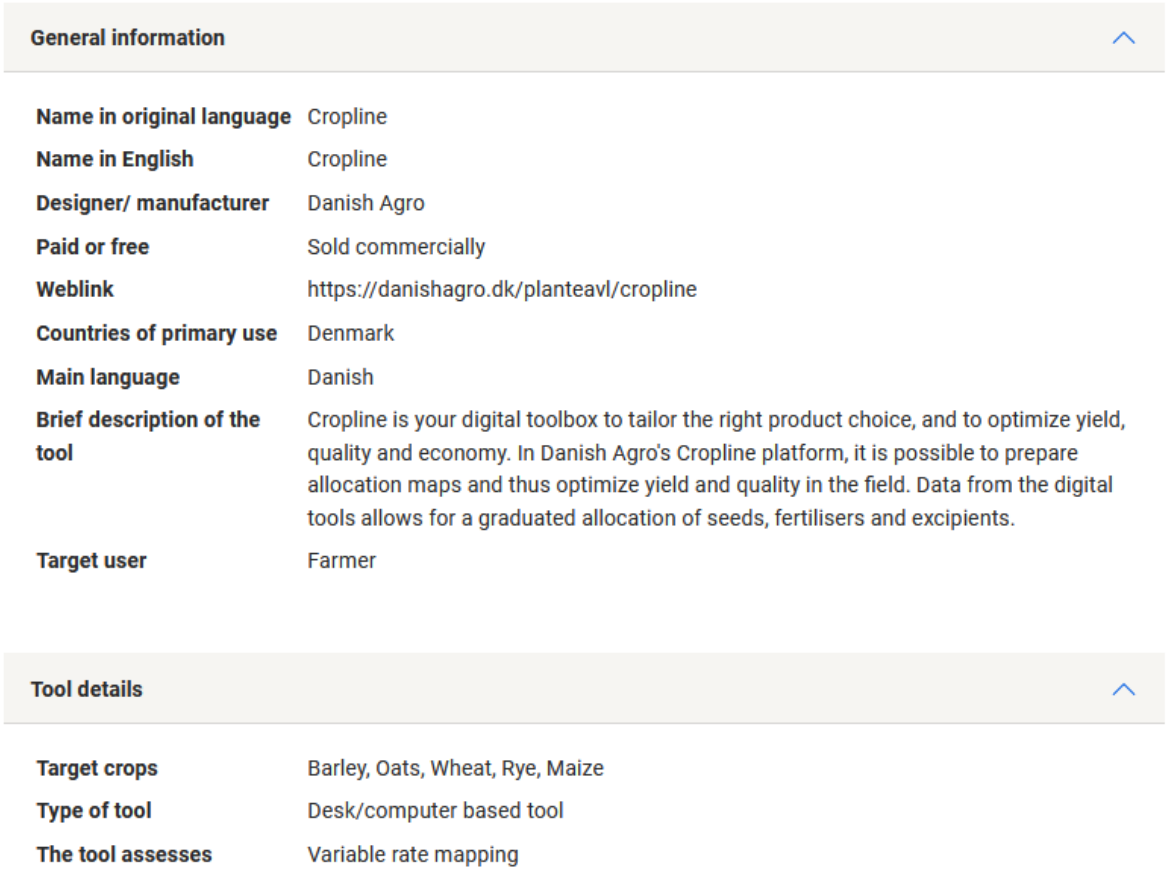

Figure 14: Tools and Services detailed information.

Finally, users may like and comment on an entry, or share it on their personal media. The "Like" function is available only to registered users.

Table 4: Tools and Services functional Requirements fulfilled by the aforementioned functionalities.

Fulfilled Functional Requirements:
FR05: Share to social media platforms
FR09: Access List of Available Tools and Services
FR10: View Details of Available Tools and Services
FR11: Search and Filter Available Tools and Services
FR15: View and Post Comments on datasets

2.4 Research Projects

*"**Research projects** on Nutrient Management advice and approaches from across Europe, seeking to contribute to making optimized nutrient management decisions. The platform contains core information and provides access to each research project identified."*

The final element of the NUTRI-CHECK NET inventory contains the Research Projects collated as part of Task 2.3 of the project. Currently, over 200 Research Projects have been identified and uploaded onto the platform.

2.4.1 Research Projects List View

Upon accessing the Research Projects element from the platform's navigation menu, users are presented with a list view of all the available research projects (Figure 15). Users may search the inventory by using the dedicated search bar or filter through the entries by ticking the desired filters. These filters represent the following categories: Countries, crop and nutrient types covered by the Research Projects and languages in which the system is available in.

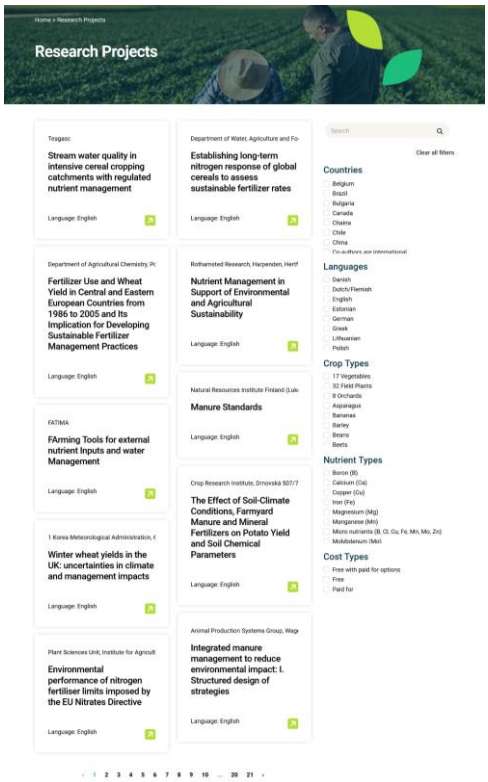

Figure 15: Research projects list view.

Upon clicking on a desired entry, users are directed to the research project's detailed view.

2.4.2 Research Projects Detailed View

Figure 16: Research Projects detailed view.

Users may access the research project's official source, as well as view the following information:

- Project name
- Project coordinator
- Project lead author
- Year completed
- Project URL
- Output URL

- Main objective
- Other objectives

Finally, users may like and comment on an entry, or share it on their personal media. The “Like” function is available only to registered users.

Table 5: Research Projects fulfilled functional requirements.

Fulfilled Functional Requirements:
FR05: Share to social media platforms
FR12: Access List of Research Projects
FR13: View Details of Research Projects
FR14: Search and Filter Research Projects
FR15: View and Post Comments on datasets

2.5 Comparison Feature

“Comparison capabilities that allow users to observe the results of the inventory by visually analyzing and inspecting the available options side-by-side.”

When navigating the list view of any of the three NCN Platform inventories, users will be prompted to click on the appropriate icon to commence the comparison:

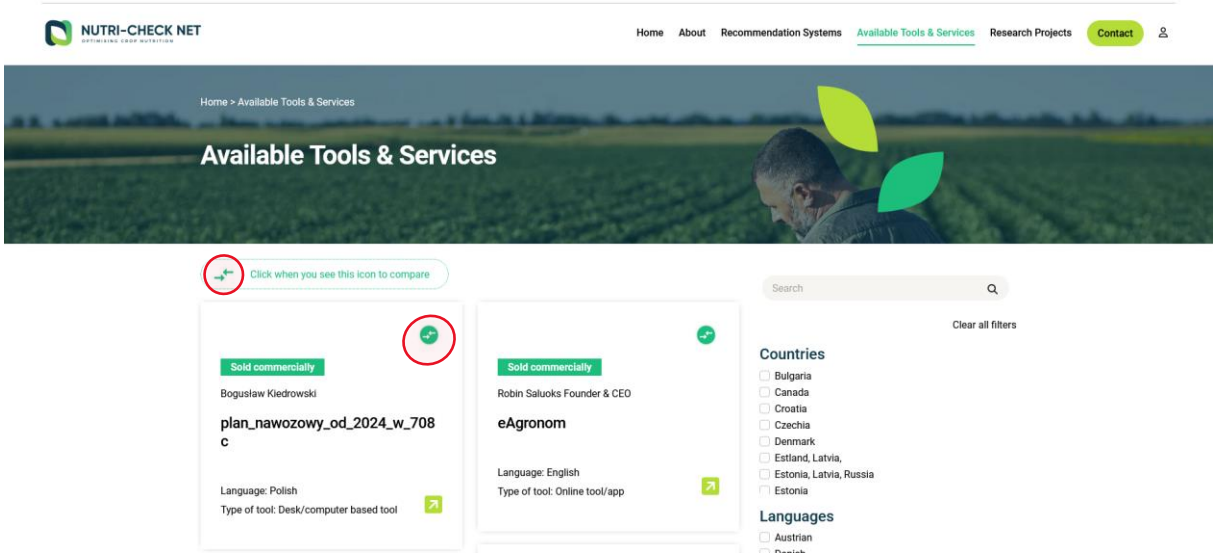

Figure 17: The comparison prompt on the list view of the "Tools and Services".

Upon clicking the comparison button on a desired entry, users will be prompted to add all entries they would like to compare in the comparison list. Note, that for the Tools and Services, users may only compare tools of the same type. After selecting their initial choice of tool, any tools not compatible will be greyed out and become unable to be added to the list.

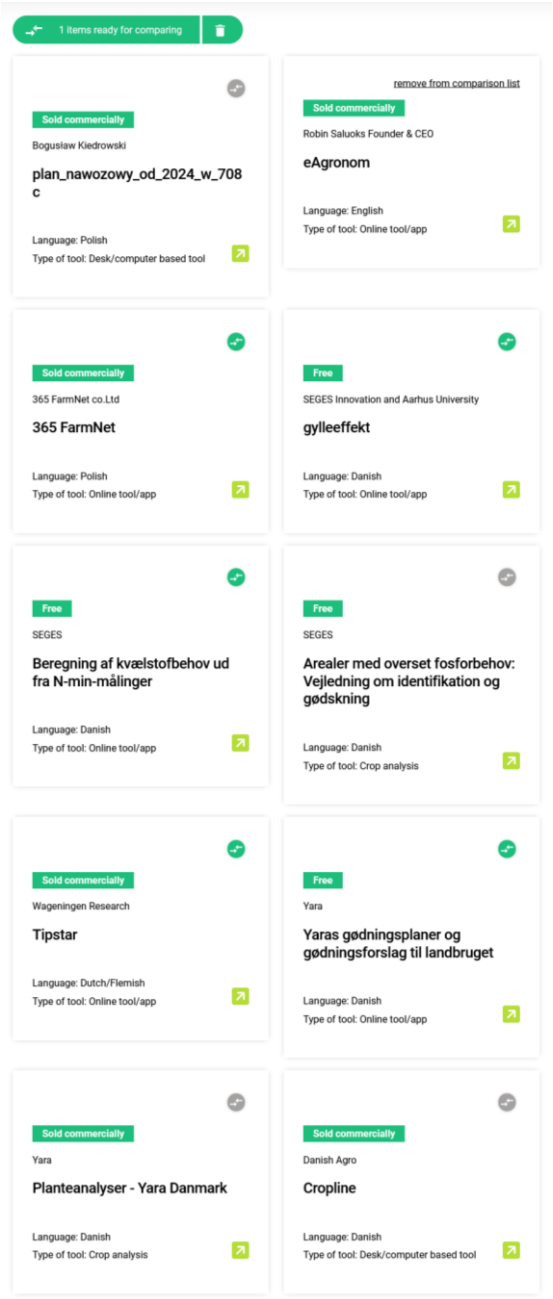

Figure 18: Selection process for the comparison list.

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Upon selecting their desired entries for comparisons, users may either remove an entry from the comparison list, or click on the appropriate button and be redirected to the comparison list.

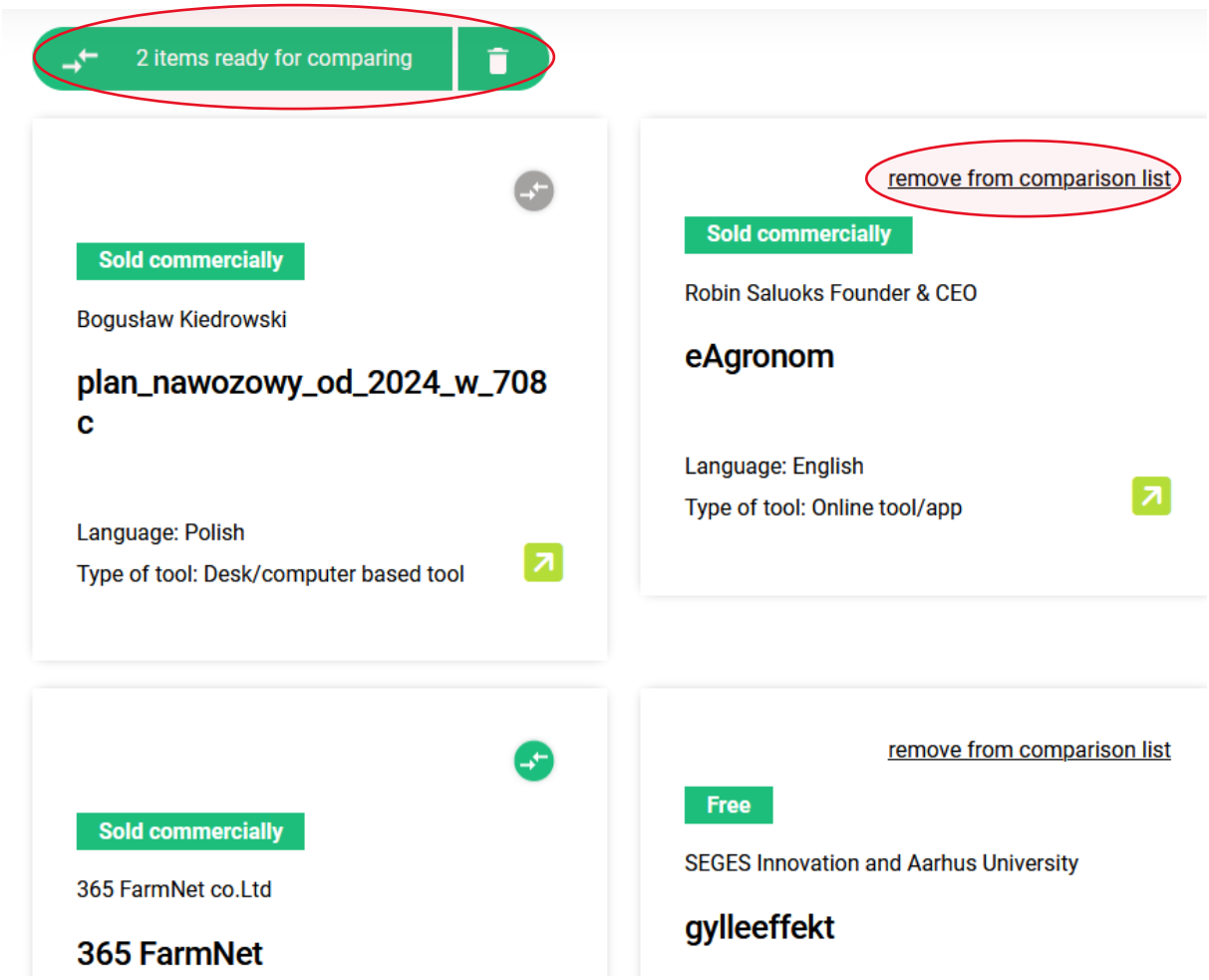

Figure 19: Comparison list ready to be viewed.

Upon entering the comparison list, users are presented with their selected entries to compare, and the option to select parameters.

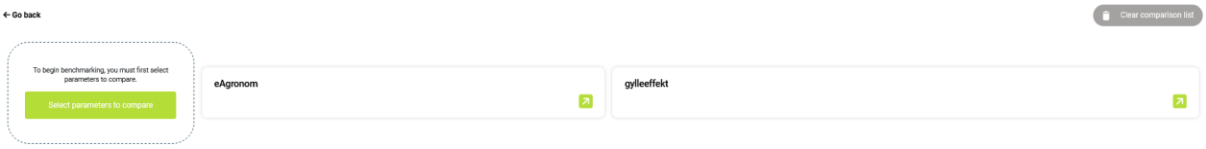

Figure 20: Initial comparison list.

Upon clicking on the “Select parameters to compare” button, the relevant menu will pop-up, where users may choose any parameters available for their entries to compare side by side.

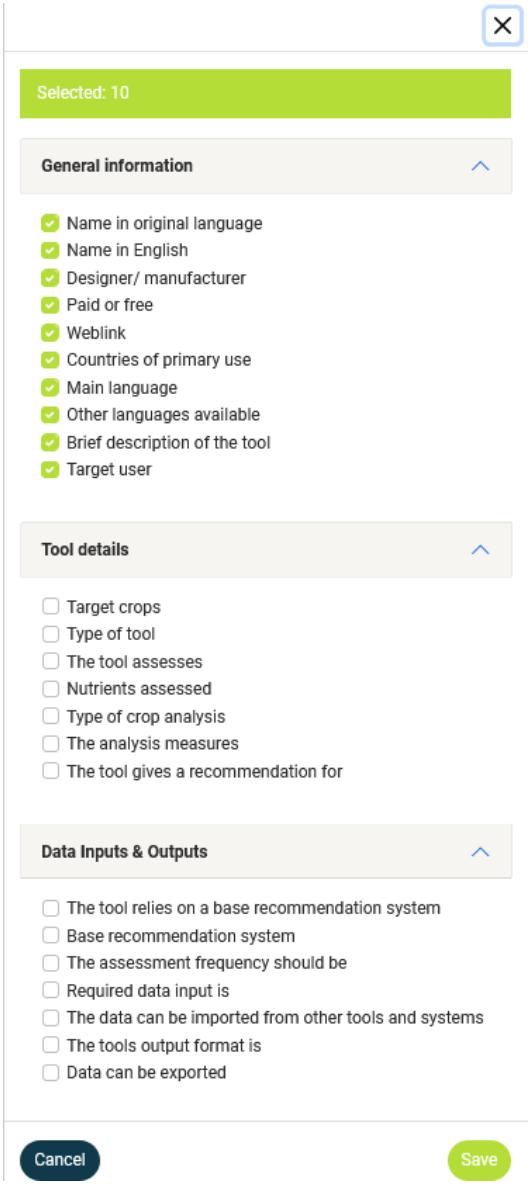

Figure 21: The parameter selection menu.

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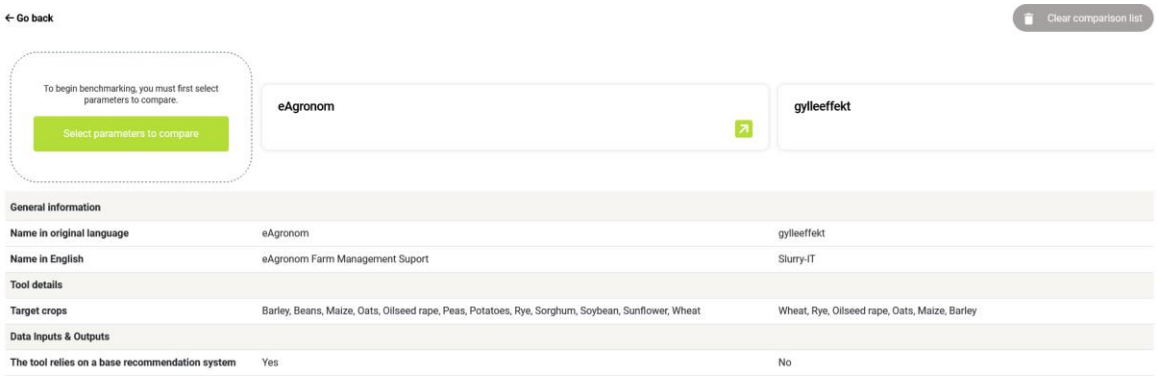
After selecting the parameters, the users are presented with the comparison for their desired entries side by side. Afterwards, users may reselect other parameters, or clear the list to begin anew and be redirected to the respective inventory page.



General information		
Name in original language	eAgronom	gylleeffekt
Name in English	eAgronom Farm Management Suport	Slurry-IT
Tool details		
Target crops	Barley, Beans, Maize, Oats, Oilseed rape, Peas, Potatoes, Rye, Sorghum, Soybean, Sunflower, Wheat	Wheat, Rye, Oilseed rape, Oats, Maize, Barley
Data Inputs & Outputs		
The tool relies on a base recommendation system	Yes	No

Figure 22: The comparison list with parameters chosen.

Table 6: Comparison functional requirements fulfilled from the aforementioned features.

Fulfilled Functional Requirements: **FR16:** Benchmarking feature

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2.6 User Profiles

Users may register on the NUTRI-CHECK NET Platform by providing the appropriate credentials. After authenticating themselves, users gain access to their user profiles and related functions (deletion, information management), as well as the ability to leave likes on the platform. The comments go through a manual review process from select members of the consortium, in order to filter out offensive, irrelevant, or spam messages.

Table 7: User Profiles fulfilled functional requirements.

Fulfilled Functional Requirements:
FR01: Registration to the NUTRI-CHECK NET Platform
FR02: Logging in to the NUTRI-CHECK NET Platform
FR03: Access to user profile
FR04: Deletion of NUTRI-CHECK NET Platform Profile

2.7 Administration Panel

The administration panel was designed to allow users with the required privileges to modify and edit the information available on the NUTRI-CHECK NET platform's database directly. Only select members of the consortium currently have access to the admin panel.

By accessing the administration panel, users are shown the entries for each individual platform element. Users may also search through the database for a specific entry.

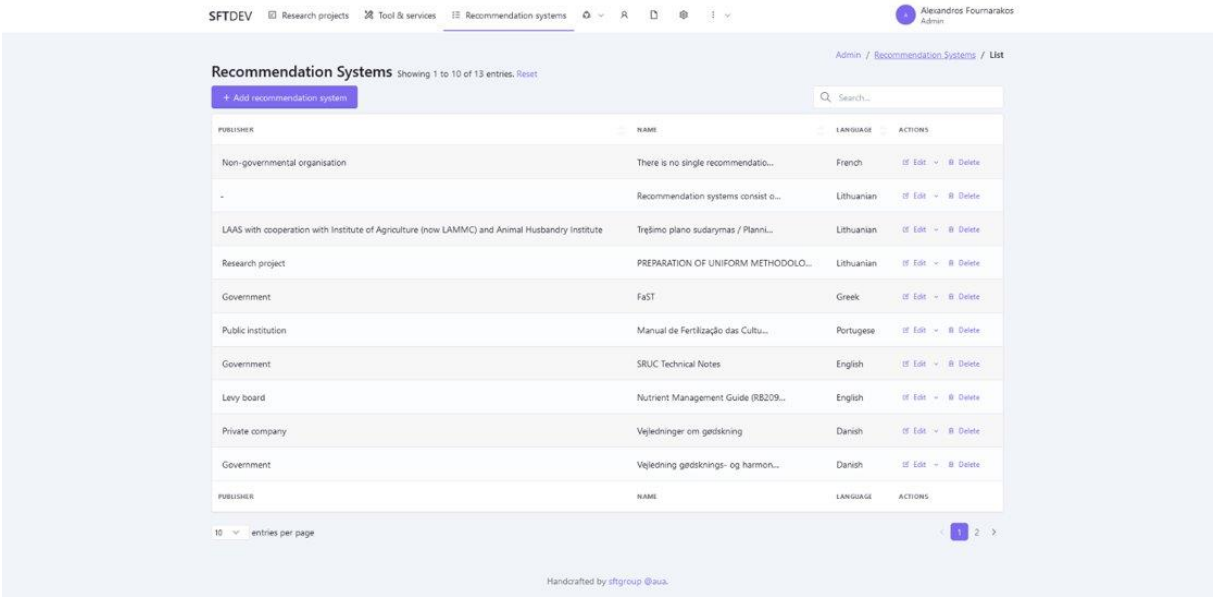

Figure 23: Administration Panel inventory view.

Upon selecting an entry, users are navigated to the menu where they may freely edit and modify the entry's information.

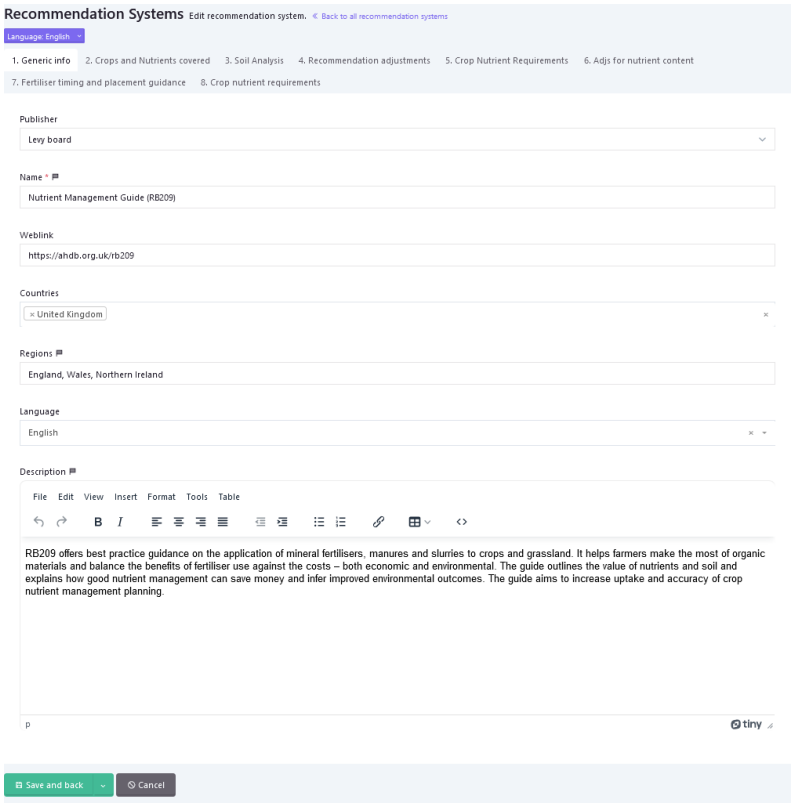

Figure 24: Administration Panel data editor.

Upon modifying any information and clicking save, those changes are updated and are visible on the platform in real-time.

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3. Platform Development

3.1 Stack selection

In web development, the “stack” refers to the combination of technologies used to create and operate a web platform. The stack includes all technologies used for the back-end, the server-side component which encompasses the logic of the application, the database, and any implementation related to the processing and management of data, as well as the front-end, the part associated with the visual design and navigation visible to and interactable by the end-users. The technologies used for the development of the NUTRI-CHECK NET Platform and their interactions are highlighted below.

Table 8: Technologies used for the development and deployment of the NCN Platform.

Technology Used		Purpose
Back-End Development	Laravel Framework	Creation of architecture model, “logic” behind the platform
	MariaDB	Design of database hosting all inventory data
	Laravel Backpack	Development of the administration panel
Front-End Development	Laravel Blade	Design of user interface of the platform
	Laravel Livewire	Creation of functionalities (filtering, pagination), UI
	Bootstrap 5 CSS	Design of UI, accessibility features

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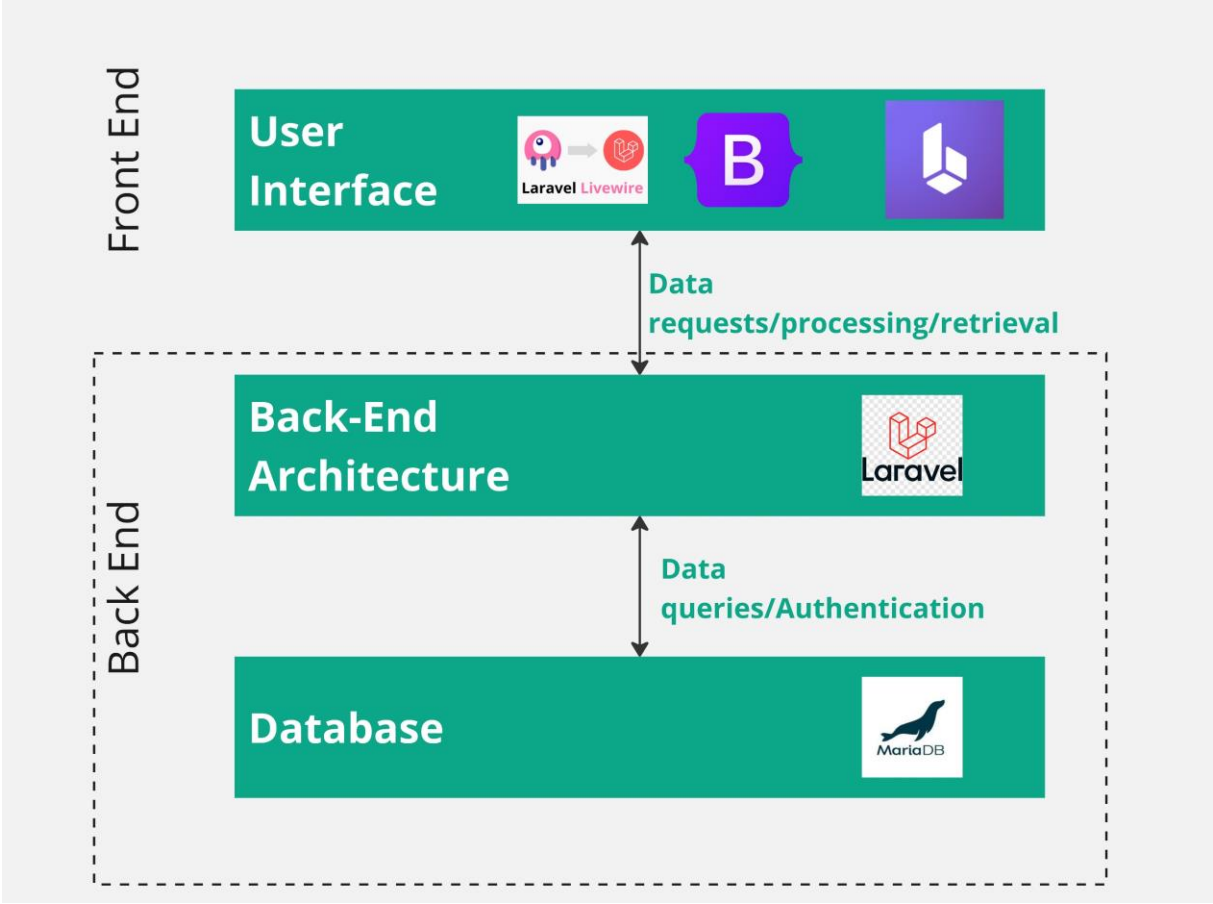

Figure 25: Technologies used for the development of the front- and back-end and interactions between them.

3.2 Database Design

In order to effectively store and organize all the inventories' data available on the NUTRI-CHECK NET Platform, a set of tables depicting their relationships was designed and illustrated in the following Entity Relationships Diagram (ERD). Each table represents an individual entity in the database (e.g., Recommendation Systems, Tools and Services, Research Projects, registered users and more), interconnected with each other through relation tables. The design of the database follows the normalization principle, which dictates the organization of the data focusing on redundancy and dependency minimization for data integrity.

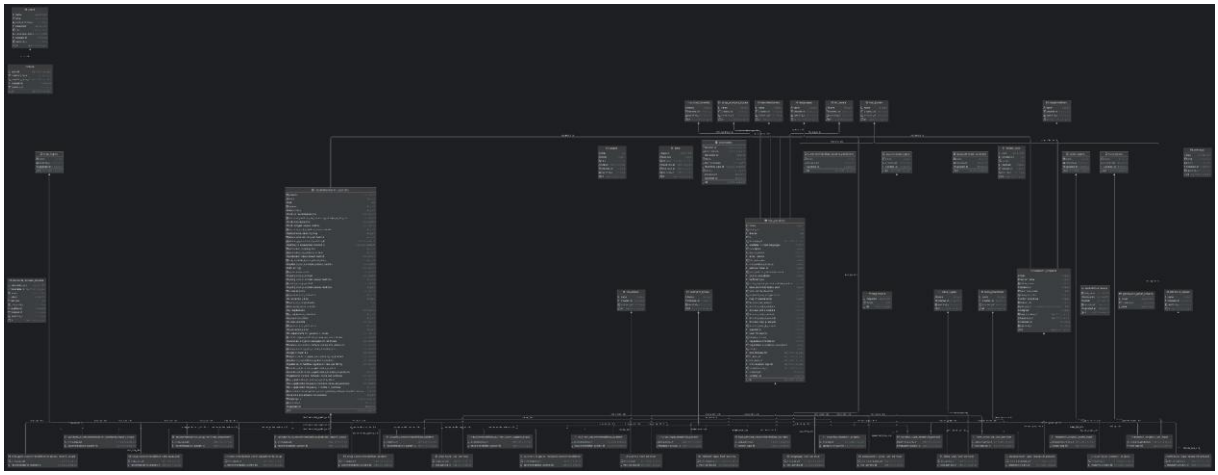

Figure 26: ERD of the NCN Inventory Database.

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4. Conclusion

The aim of D4.2 “NUTRI-CHECK NET Platform Initial Version” was to complement the scheduled release of the NCN Platform in Month 18 of the project, by detailing the progress behind the content and functionalities of the platform. This deliverable focuses on the development and deployment of the Milestone and Initial Version (Month 14 and Month 18, respectively), guided through the creation of the inventory from WP2, as well as feedback and inputs from the project’s executive board and broader consortium. Careful consideration of the stack and the design of the platform were made, all validated by the project’s consortium.

In accordance with the project developments, the NUTRI-CHECK NET Platform will undergo rigorous refinements, aiming to optimize the user experience and improve functionalities. A major focus after the launch of the initial version will be the continual evaluation of the platform, gathering feedback from all different user groups in the project’s ecosystem, including the Crop Nutrition Clubs, National Expert Groups, as well as external users interested in crop nutrition. An agile development framework will be supported by the continual assessments of user needs, aiming to ameliorate and enhance existing features based on user feedback, as well as consider further updates, committed to optimizing user experience.

The existing data will also be expanded to reflect the progress of the project’s inventory of Recommendation Systems, Available Tools and Services and Research Projects (documented through D2.3 “Report on inventory of recommendation systems, research results & commercial tools”).

Moreover, the platform’s post-project longevity will be considered, aiming to increase and sustain the platform’s activities even after the project’s lifetime. NUTRI-CHECK NET will ensure that the main outcomes will feed the EU-FarmBook project under the topic “HE-CL6-2021-GOV-01-24”: EU-wide inventory”, further solidifying the platform’s sustainability. This will also be supported as the platform contents will be made available through a dedicated API, which will allow its integration into other third-party platforms. At least three API connections will be made by the project’s end, including the aforementioned connection to the EU-FarmBook.

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Annex

List of functional requirements from D4.1

- FR01: Registration to the NUTRI-CHECK NET Platform
- FR02: Logging in to the NUTRI-CHECK NET Platform
- FR03: Access to user profile
- FR04: Deletion of NUTRI-CHECK NET Platform Profile
- FR05: Share to social media platforms
- FR06: Access List of Nutrient Management Recommendation Systems and Services
- FR07: View Details of Nutrient Management Recommendation Systems and Services
- FR08: Search and Filter Nutrient Management Recommendation Systems and Services
- FR09: Access List of Available Tools and Services
- FR10: View Details of Available Tools and Services
- FR11: Search and Filter Available Tools and Services
- FR12: Access List of Research Projects
- FR13: View Details of Research Projects
- FR14: Search and Filter Research Projects
- FR15: View and Post Comments on datasets
- FR16: Benchmarking function
- FR17: Access to Self-API and Documentation
- FR18: Access to the EU-FarmBook API
- FR19: Access live events
- FR20: Access to List of events
- FR21: Access to recordings of events
- FR22: Link to NUTRICHECK-NET Website

Mock-ups designed on AdobeXD may be found here:
https://xd.adobe.com/view/e9217f5e-b0d4-4250-8e6d-e6c6d0e4ab70-bc72/

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